Having described the invention, I claim:

1. A minimally invasive apparatus for harvesting bone marrow cells, blood, and bone fragments, said apparatus comprising:

a rigid cannula having a proximal end and a distal end with an opening, said distal end including a cutting tip that is movable axially and radially to cut and disrupt bone tissue while preserving necessary viability among harvested marrow cells, said cannula further including an inner surface defining an internal passage that extends from said opening toward said proximal end; and

means for applying suction to said internal passage in said cannula for drawing bone marrow cells, blood, and bone fragments disrupted from the bone tissue by said cutting tip into said internal passage for collection.

2. The apparatus of claim 1 further comprising control means for controlling said means for applying suction.

3. The apparatus of claim 1 further comprising means for controllably supplying irrigation fluid into said internal passage in said cannula.

4. The apparatus of claim 3 wherein said means for controllably supplying irrigation fluid is operatively coupled to control means for controlling said means for applying suction in order that irrigation fluid flow and suction can be oscillated so as not to coincide.

5. The apparatus of claim 1 further comprising means for controllably injecting an anticoagulant fluid into the harvested bone marrow cells, blood, and bone fragments during collection.

6. The apparatus of claim 5 wherein said cannula further includes a plurality of nozzles adjacent said distal end for introducing anticoagulant fluid into harvested bone marrow cells, blood, and bone fragments immediately following their harvest.

7. The apparatus of claim 1 further comprising a collection chamber in fluid communication with said internal passage for receiving and collecting the harvested bone marrow cells, blood, and bone fragments.

8. The apparatus of claim 1 further comprising a sheath disposed co-axially about a portion of said cannula for providing and maintaining a single percutaneous puncture site.

9. The apparatus of claim 1 further comprising a rotatable shaft disposed co-axially within said internal passage in said cannula, said shaft having a distal end with a cutting bit for cutting and disrupting bone tissue while preserving necessary viability among harvested marrow cells, said cutting bit projecting through said opening in said cannula.

10. The apparatus of claim 9 further comprising means for rotating said shaft and said cutting bit.

11. The apparatus of claim 10 further comprising control means for controlling said means for rotating said shaft.

12. The apparatus of claim 9 wherein said cannula includes a radially extending end wall that closes a portion of said opening at said distal end of said cannula, said end wall having an axially extending passage through which said shaft projects.

13. The apparatus of claim 12 wherein said cannula includes a plurality of circumferentially spaced radially extending apertures through which bone marrow cells, blood, and bone fragments disrupted from the bone tissue are aspirated by said means for applying suction.

14. The apparatus of claim 1 wherein said cannula includes a plurality of circumferentially spaced radially extending apertures through which bone marrow cells, blood, and bone fragments disrupted from the bone tissue are aspirated by said means for applying suction.

15. The apparatus of claim 1 wherein said opening at said distal end of said cannula extends in the radial direction through said inner surface of said cannula.

16. The apparatus of claim 15 wherein said distal end of said cannula includes a plurality of third nozzles adjacent said radial opening for introducing an anticoagulant fluid into harvested bone marrow cells, blood, and bone fragments.

17. The apparatus of claim 15 further comprising a rotatable shaft disposed coaxially with said internal passage in said cannula, said shaft having a distal end with a cutting bit for cutting and disrupting bone tissue while preserving necessary viability among harvested marrow cells, said cutting bit being disposed within said radial opening in said cannula.

18. The apparatus of claim 17 wherein said cannula includes a radially extending wall that closes off a portion of said internal passage at said distal end of said cannula, said end wall having an axially extending passage through which said shaft projects.

19. The apparatus of claim 18 wherein said cannula includes a plurality of circumferentially spaced radially extending apertures through which bone marrow cells, blood, and bone fragments disrupted from the bone tissue are aspirated by said means for applying suction.

20. A minimally invasive apparatus for harvesting bone marrow cells, blood, and bone fragments, said apparatus comprising:

a rotatable shaft having a distal end, said distal end including a cutting bit for cutting and disrupting bone tissue while preserving necessary viability among harvested marrow cells;

means for rotating said shaft;

a rigid cannula disposed co-axially about at least a portion of said shaft, said cannula having a distal end with an opening through which said cutting bit extends, said cannula further having an inner surface defining an internal passage that extends from said opening toward a proximal end of said cannula; and

means for applying suction to said internal passage in said cannula for drawing bone marrow cells, blood, and bone fragments disrupted from the bone tissue by said cutting bit into said internal passage for collection.

21. The apparatus of claim 20 further comprising control means for controlling said means for rotating said shaft.

22. The apparatus of claim 20 further comprising control means for controlling said means for applying suction.

23. The apparatus of claim 20 further comprising means for controllably supplying irrigation fluid to said distal end of said shaft.

24. The apparatus of claim 20 further comprising means for controllably supplying irrigation fluid into said internal passage in said cannula.

25. The apparatus of claim 24 wherein said means for controllably supplying irrigation fluid is operatively coupled to control means for controlling said means for applying suction in order that irrigation fluid flow and suction can be oscillated so as not to coincide.

26. The apparatus of claim 20 further comprising means for controllably injecting an anticoagulant fluid into the harvested bone marrow cells, blood, and bone fragments during collection.

27. The apparatus of claim 26 wherein said cannula further includes a plurality of nozzles adjacent said distal end for introducing anticoagulant fluid into harvested bone marrow cells, blood, and bone fragments immediately following their harvest.

28. The apparatus of claim 20 further comprising a collection chamber in fluid communication with said internal passage for receiving and collecting the harvested bone marrow cells, blood, and bone fragments.

29. The apparatus of claim 20 further comprising a sheath disposed coaxially about a portion of said cannula for providing and maintaining a single percutaneous puncture site.

30. The apparatus of claim 20 wherein said cannula includes a plurality of circumferentially spaced radially extending apertures through which bone marrow cells, blood, and bone fragments disrupted from the bone tissue are aspirated by said means for applying suction.

31. The apparatus of claim 30 wherein said cannula includes a radially extending end wall that closes a portion of said opening at said distal end of said cannula, said end wall having an axially extending passage through which said shaft projects.

32. The apparatus of claim 20 wherein said distal end of said cannula includes a cutting tip that is movable axially and radially to cut and disrupt bone tissue while preserving necessary viability among harvested marrow cells.

33. The apparatus of claim 20 wherein said opening at said distal end of said cannula extends in the radial direction through said inner surface of said cannula.

34. The apparatus of claim 16 wherein said distal end of said cannula includes a plurality of third nozzles adjacent said radial opening for introducing an anticoagulant fluid into harvested bone marrow cells, blood, and bone fragments.

35. The apparatus of claim 32 wherein said cannula includes a radially extending wall that closes off a portion of said internal passage at said distal end of said cannula, said end wall having an axially extending passage through which said shaft projects.

36. The apparatus of claim 34 wherein said cannula includes a plurality of circumferentially spaced radially extending apertures through which bone marrow cells, blood, and bone fragments disrupted from the bone tissue are aspirated by said means for applying suction.

37. A minimally invasive method for harvesting bone marrow cells, blood, and bone fragments, said method comprising the steps of:

(a) providing a cannula having a proximal end and a distal end with an opening, the distal end including a cutting tip for disrupting bone tissue while preserving necessary viability among harvested marrow cells, the cannula further including an inner surface defining an internal passage that extends from the opening toward the proximal end;

(b) inserting the distal end of the cannula through a puncture site, through the cortex of a bone, and into the intramedullary canal of the bone;

(c) applying suction to the internal passage which draws bone marrow cells, blood, and bone fragments disrupted from the cancellous bone into the internal passage for collection;

(d) manually moving the distal end of the cannula in both axial and radial directions within the intramedullary canal to cut and disrupt the bone tissue;

(e) manually moving the distal end of the cannula to different locations in the cancellous bone and disrupting additional bone tissue with the apparatus remaining in the same puncture site; and

(f) repeating steps (d) and (e) to further collect bone marrow cells, blood, and bone fragments.

38. The method of claim 37 further comprising the step of supplying irrigation fluid to the distal end of the cannula to minimize thermal or mechanical trauma to the harvested cells and to help carry the harvested bone marrow cells, blood, and bone fragments into the passage.

39. The method of claim 37 further comprising the step of supplying an anticoagulant fluid into the harvested bone marrow cells, blood, and bone fragments to inhibit clot formation.

40. The method of claim 39 further comprising the step of oscillating the supply of irrigation fluid and the supply of anticoagulant fluid.

41. The method of claim 39 further comprising the step of supplying the anticoagulant fluid at a location adjacent the distal end of the cannula.

42. The method of claim 37 further comprising the steps of :

providing a collection reservoir for collecting the harvested bone marrow cells, blood, and bone fragments; and

fluidly connecting the internal passage in the cannula with the collection reservoir.

43. The method of claim 37 further comprising the steps of:

providing a sheath that is disposed co-axially about a portion of the cannula;

inserting the sheath percutaneously to the cortex of the bone so that the sheath provides and maintains a single percutaneous puncture site for harvesting bone marrow cells, blood, and bone fragments.

44. The method of claim 37 further comprising the steps of:

providing a rotatable shaft disposed co-axially within the internal passage in the cannula, the shaft having distal end with a cutting bit that projects through the opening in the cannula; and

rotating the shaft and the cutting bit to cut and disrupt bone tissue in the intramedullary canal while preserving necessary viability among harvested marrow cells.

45. The method of claim 37 further comprising the step of aspirating bone marrow cells, blood, and bone fragments disrupted from the bone tissue through a plurality of circumferentially spaced radially oriented apertures at the distal end of the cannula.

46. A minimally invasive method for harvesting bone marrow cells, blood, and bone fragments, said method comprising the steps of:

(a) providing an apparatus having a rotatable shaft with a distal end for disrupting bone tissue, the apparatus further including means for rotating the shaft and a cannula encircling the shaft to define an annular passage;

(b) inserting the distal end of the shaft through a puncture site, through the cortex of a bone, and into the intramedullary canal of the bone;

(c) rotating the shaft to cause the cutting bit to rotate and disrupt the cancellous bone in the intramedullary canal;

(d) applying suction to the annular passage which draws bone marrow cells, blood, and bone fragments disrupted from the cancellous bone into the annular passage for collection;

(e) manually moving the distal end of the shaft to different locations in the cancellous bone and disrupting additional bone tissue with the apparatus remaining in the same puncture site; and

(f) repeating steps (c) and (d) to further collect bone marrow cells, blood, and bone fragments.

47. The method of claim 46 further comprising the step of supplying irrigation fluid to the distal end of the shaft to minimize thermal or mechanical trauma to the harvested cells and to help carry the harvested bone marrow cells, blood, and bone fragments into the passage.

48. The method of claim 46 further comprising the step of supplying an anticoagulant fluid into the harvested bone marrow cells, blood, and bone fragments to inhibit clot formation.

49. The method of claim 48 further comprising the step of oscillating the supply of irrigation fluid and the supply of anticoagulant fluid.

50. The method of claim 48 further comprising the step of supplying the anticoagulant fluid at a location adjacent the distal end of the cannula.

51. The method of claim 46 further comprising the steps of:

providing a collection reservoir for collecting the harvested bone marrow cells, blood, and bone fragments; and

fluidly connecting the passage in the cannula with the collection reservoir.

52. The method of claim 46 further comprising the steps of:

providing a sheath that is disposed co-axially about a portion of the cannula;

inserting the sheath percutaneously to the cortex of the bone so that the sheath provides and maintains a single percutaneous puncture site for harvesting bone marrow cells, blood, and bone fragments.

53. The method of claim 46 further comprising the steps of:

(a) manually moving the distal end of the cannula in both axial and radial directions within the intramedullary canal to cut and disrupt the bone tissue;

(b) manually moving the distal end of the cannula to different locations in the cancellous bone and disrupting additional bone tissue with the apparatus remaining in the same puncture site; and

(c) repeating steps (d) and (e) to further collect bone marrow cells, blood, and bone fragments.

54. The apparatus of claim 46 further comprising the step of aspirating bone marrow cells, blood, and bone fragments disrupted from the bone tissue through a plurality of circumferentially spaced radially oriented apertures at the distal end of the cannula.